

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A process chamber cleaning method in a substrate processing apparatus configured to perform a nitriding process or oxidizing process as a predetermined process on a target substrate accommodated in a process chamber, the method comprising:

performing a cleaning cycle a plurality of times within the process chamber ~~that does not accommodate in which the target substrate is not present~~, wherein the cleaning cycle ~~alternately includes, in an alternating manner,~~

~~generating first plasma of a first period of cleaning the process chamber by supplying a first mixture gas consisting essentially of oxygen gas and argon gas within into the process chamber to clean the process chamber and generating first plasma of the first mixture gas,~~
and

~~generating second plasma of a second period of cleaning the process chamber by supplying a second mixture gas consisting essentially of nitrogen gas and argon gas within into the process chamber to clean the process chamber and generating second plasma of the second mixture gas,~~

~~wherein the process chamber cleaning method comprises no period of cleaning the process chamber by use of a fluorine-containing compound.~~

Claim 2 (Previously Presented): The process chamber cleaning method according to claim 1, wherein each of the first plasma and the second plasma has an electron temperature of 2 eV or less.

Claim 3 (Previously Presented): The process chamber cleaning method according to claim 1, wherein each of the first plasma and the second plasma is generated by microwaves supplied into the process chamber through a planar antenna having a plurality of slots and disposed on the process chamber to face the target substrate.

Claims 4-11 (Canceled).

Claim 12 (Currently Amended): A substrate processing method for performing a nitriding process ~~or oxidizing process as a predetermined process~~ on a target substrate accommodated in a process chamber, the method comprising:

performing a cleaning cycle a plurality of times within the process chamber ~~that does not accommodate in which the target substrate is not present~~, wherein the cleaning cycle alternately includes ~~generating first plasma of~~ includes, in an alternating manner, a first period of cleaning the process chamber by supplying a first mixture gas consisting essentially of oxygen gas and argon gas ~~within into~~ the process chamber to clean the process chamber ~~and generating first plasma of the first mixture gas, and generating second plasma of a second period of cleaning the process chamber by supplying a second mixture gas consisting essentially of nitrogen gas and argon gas~~ ~~within into~~ the process chamber to clean the process chamber ~~and generating second plasma of the second mixture gas;~~

after the performing, seasoning the process chamber ~~that does not accommodate the target substrate by generating plasma of the first mixture gas or generating plasma of in which the target substrate is not present by supplying~~ the second mixture gas ~~within into~~ the process chamber and generating plasma of the second mixture gas; and

after the seasoning, loading the target substrate into the process chamber and performing the predetermined nitriding process on the target substrate,

wherein the substrate processing method comprises no period of cleaning the process chamber by use of a fluorine-containing compound inside the cleaning cycle or between the cleaning cycle and the nitriding process.

Claim 13 and 14 (Canceled).

Claim 15 (Previously Presented): The substrate processing method according to claim 12, wherein each of the first plasma and the second plasma is set to have an electron temperature of 2 eV or less.

Claim 16 (Previously Presented): The substrate processing method according to claim 12, wherein each of the first plasma and the second plasma is low electron temperature plasma generated by microwaves supplied into the process chamber through a planar antenna having a plurality of slots and disposed on the process chamber to face the target substrate.

Claim 17 (Canceled).

Claim 18 (Previously Presented): The process chamber cleaning method according to claim 1, wherein, after the performing the cleaning cycle a plurality of times, the method further comprises a final operation period using plasma of the first mixture gas or the second mixture gas, and the final operation period comprises a plasma generation time longer than a generation time of the first plasma or the second plasma of the cleaning cycle.

Claim 19 (Canceled).

Claim 20 (Previously Presented): The process chamber cleaning method according to claim 1, wherein the cleaning cycle comprises performing vacuum-exhaust of the process chamber and introducing argon gas into the process chamber between the generating the first plasma and the generating the second plasma.

Claim 21 (Canceled).

Claim 22 (Previously Presented): The substrate processing method according to claim 12, wherein the cleaning cycle and the seasoning are performed while a dummy substrate is placed on a table for placing the target substrate, so as to protect the table.

Claim 23 (Previously Presented): The substrate processing method according to claim 12, wherein the seasoning comprises a plasma generation time longer than a generation time of the first plasma or the second plasma of the cleaning cycle.

Claim 24 (Canceled).

Claim 25 (Previously Presented): The substrate processing method according to claim 12, wherein the cleaning cycle comprises performing vacuum-exhaust of the process chamber and introducing argon gas into the process chamber between the generating the first plasma and the generating the second plasma.

Claim 26 (New): The process chamber cleaning method according to claim 1, wherein the first mixture gas is set such that the oxygen gas is supplied at a flow rate smaller than a flow rate of the argon gas of the first gas mixture and the second mixture gas is set

such that the nitrogen gas is supplied at a flow rate smaller than a flow rate of the argon gas of the second gas mixture.

Claim 27 (New): The substrate processing method according to claim 12, wherein the first mixture gas is set such that the oxygen gas is supplied at a flow rate smaller than a flow rate of the argon gas of the first gas mixture and the second mixture gas is set such that the nitrogen gas is supplied at a flow rate smaller than a flow rate of the argon gas of the second gas mixture.

Claim 28 (New): A substrate processing method for performing an oxidizing process on a target substrate accommodated in a process chamber, the substrate processing method comprising:

performing a cleaning cycle a plurality of times within the process chamber in which the target substrate is not present, wherein the cleaning cycle includes, in an alternating manner, a first period of cleaning the process chamber by supplying a first mixture gas consisting of oxygen gas and argon gas into the process chamber and generating first plasma of the first mixture gas, and a second period of cleaning the process chamber by supplying a second mixture gas consisting of nitrogen gas and argon gas into the process chamber and generating second plasma of the second mixture gas;

after the performing, seasoning the process chamber in which the target substrate is not present by supplying the first mixture gas into the process chamber and generating plasma of the first mixture gas; and

after the seasoning, loading the target substrate into the process chamber and performing the oxidizing process on the target substrate,

wherein the substrate processing method comprises no period of cleaning the process chamber by use of a fluorine-containing compound inside the cleaning cycle or between the cleaning cycle and the oxidizing process.

Claim 29 (New): The substrate processing method according to claim 28, wherein each of the first plasma and the second plasma is set to have an electron temperature of 2 eV or less.

Claim 30 (New): The substrate processing method according to claim 28, wherein each of the first plasma and the second plasma is low electron temperature plasma generated by microwaves supplied into the process chamber through a planar antenna having a plurality of slots and disposed on the process chamber to face the target substrate.

Claim 31 (New): The substrate processing method according to claim 28, wherein the cleaning cycle and the seasoning are performed while a dummy substrate is placed on a table for placing the target substrate, so as to protect the table.

Claim 32 (New): The substrate processing method according to claim 28, wherein the seasoning comprises a plasma generation time longer than a generation time of the first plasma or the second plasma of the cleaning cycle.

Claim 33 (New): The substrate processing method according to claim 28, wherein the cleaning cycle comprises performing vacuum-exhaust of the process chamber and introducing argon gas into the process chamber between the generating the first plasma and the generating the second plasma.

Claim 34 (New): The substrate processing method according to claim 28, wherein the first mixture gas is set such that the oxygen gas is supplied at a flow rate smaller than a flow rate of the argon gas of the first gas mixture and the second mixture gas is set such that the nitrogen gas is supplied at a flow rate smaller than a flow rate of the argon gas of the second gas mixture.